

<b>BROOKHAVEN NATIONAL LABORATORY</b> Safety & Health Services Division  <b>INDUSTRIAL HYGIENE GROUP</b> Standard Operating Procedure	NUMBER <b>IH99600</b>
	REVISION <b>Final Rev0</b>
SUBJECT: I  <b>Protek 3201N RF Spectrum Analyzer</b>	DATE <b>06/18/07</b>
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### **1.0 Purpose/Scope**

This procedure provides a standardized method for operation of the Protek 3201N 2 GHz RF Field Strength Analyzer. It should be used in conjunction with the SBMS Subject Area RF/Microwave Radiation, SOP IH99150, and specific procedures for the particular instrument to be used for exposure monitoring.

The Protek 3201N is used to determine the frequency of an unknown radio frequency (RF) field. The frequency is displayed on a grid in a running wave form, and must be interpreted by approximation on a graph. The results of this measurement can then be used to determine which RF exposure monitoring should be done using a power density or field strength meter in units that are comparable with occupational exposure limits. This procedure offers a standardized technique to be used to operate the meter. It also provides the safety measures to ensure the IH professional personnel performing the RF frequency measurements are not exposed to undue risk of non-ionizing radiation from RF fields.

### **2.0 Responsibilities**

Use of the procedure is to be limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the procedures and its safety measures, as evidenced by experience and training, to qualification criteria set in Section 7.

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### **3.0 Definitions**

*Radio frequency (RF):* A frequency that is used for radio transmission. Note: Although the RF spectrum is formally defined in terms of frequency from 0 to 3000 GHz, for purposes of this standard, the frequency range of interest is 30 KHz to 300 GHz. The *Protek 3201N* can be used to determine frequencies up to 2GHz.

### **4.0 Prerequisites**

#### **4.1 Training prior to using this procedure:**

- 4.1.1 Demonstration of proper operation of the procedure per Section 7 for qualification requirements.
- 4.1.2 Training for hazards other than RF may be needed for entry into restricted areas (check with ESH Coordinator or FS Representative for the facility).

#### **4.2 Area Access:**

- 4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas.
- 4.2.2 Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Work Permit is needed or is in effect. If so, review and sign the permit.
- 4.2.3 Use appropriate PPE for area.

### **5.0 Precautions**

**5.1 Hazard assessment:** The actual task of measurement with the RF field strength analyzer typically does not cause significant employee health risks. But by its very nature, analysis under this SOP may be performed in areas with high RF fields. These hazards must be assessed on a case-by-case basis. No one is to perform measurement until a knowledgeable individual has assessed the hazards of the area. This meter does not measure RF field strength for personnel exposure to RF fields.

**5.2 Personal Protective Equipment:** No PPE is required for use of this meter. Appropriate personal protective equipment for the area to be entered must be used. Refer to the Work Permit or instructions as applicable.

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5.3 **Work Planning:** All requirements of work permits and work planning system reviews must be met in performing this procedure.

5.4 **Environmental Impact and Waste Disposal:** This sampling does not have adverse impact on the environment or create waste for disposal.

5.5 **Job Risk Assessment:** Consult the *Job Risk Assessment* IHG-JRA-05 for the risk analysis of this operation based on the hazards and controls of this SOP.

## 6.0 Procedure

### Equipment:

- Protek 3201N
- Antenna – attach to the meter case prior to turning the instrument on.
- AC Adaptor/Charger or DC charger

### Operation:

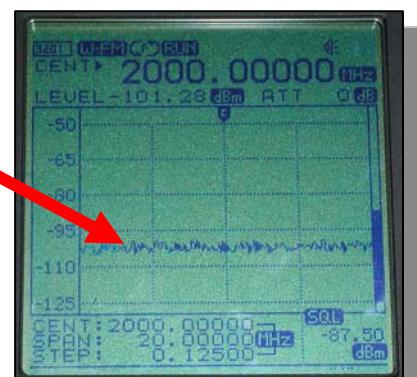
- 6.1 Turn on the meter by pressing the **POWER** button on the bottom left of the meter face. The battery display is on the upper right hand corner of the screen; ensure sufficient battery strength is available for the measurement time needed. If the battery is low, the display will not come on, and the meter must be charged by plugging in the AC adaptor, or the DC charger for vehicle use. The meter can also be used while plugged in.



The display should automatically come up with the following header:



- 6.2 Push the blue **Run** button to start scanning. The header should change to “RUN” and a wave form

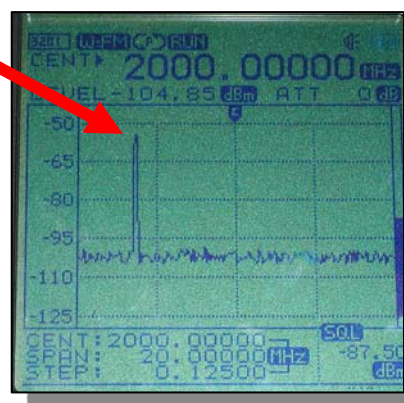


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should start running along the grid. (There will be no peaks if the source is off.)

- 6.3 Hold the analyzer antenna near the source, and look for a peak on the wave form grid. The default range is **0 – 2000 MHz**. Each vertical separation is 500 MHz. Press the **Run** button to start scanning.

The screen display to the right shows the meter result of a **Run** detecting the field from a 400 MHz two-way radio signal. Note that the peak is registered between the left axis (0 MHz) and the first grid mark (500 MHz). Full scale is on this view is 2000 MHz.



- 6.4 The range can be changed to get a more accurate reading of the frequency. The maximum span of the range in this mode is 400 MHz. To change the span of the grid:
- 6.4.1 Push the **SHIFT** key, then the **1** key [**Start/Stop**].
  - 6.4.2 Input the starting frequency (e.g. 100. [include the decimal point]) using the gray numeric keys.
  - 6.4.3 Select the frequency range: **GHz**, **MHz**, or **kHz**. (These are the shifted values of the **Run**, **Mode**, or **Sweep** keys.)
  - 6.4.4 The display will prompt you for the stop frequency. Input the ending frequency you wish to see on the display (e.g. 300.) and then **MODE**.
- 6.5 To get back to the full frequency spectrum (0-2000 MHz), push **MENU**, the first item on the list is **FUNCTION**, push **ENTER**, and **ENTER** (this takes you back to the starting display (same as when first powered up). Push **RUN** to get the instrument to display the full spectrum. The *Protek 3201N* meter is capable of operating in other modes, however this procedure describes the mode most useful for the purpose of identifying the frequencies of interest at BNL. Consult the Users Manual, reference 8.1 for more information on other operating configurations.
- 6.6 If the meter is in a different mode, turn the power off and on again to get back to the default startup mode.
- 6.7 Turn off the meter by pressing the **POWER** button on the bottom left of the meter face.
- 6.8 Documenting Sampling Data: Use the Direct Reading Instrument form (see IH60500 to

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record information including the locations, time of day, operating conditions, etc).

## 7.0 Implementation and Training

Prior to using this procedure, the user is to:

- 7.1 Demonstrate proper operation of this instrument to the satisfaction of the SHSD IH Manager or designee. Complete qualification on this procedure on at least a 3 year basis, providing the professional uses the equipment several times per year. Personnel are to document their training using the Attachment 9.2 with its *Job Performance Measure Completion Certificate* for this meter.
- 7.2 Complete other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).
- 7.3 Complete OT&Q Training and a medical surveillance required for any PPE used on the job or for other hazards encountered in the work area.
- 7.4 Complete web based class TQ-RF/MW-Safe and review Job Risk Assessment SHSD-JRA-05.

## 8.0 References

- 8.1 *Protek® 3201N* User's Manual

## 9.0 Attachments

- 9.1 Short Operating Instructions
- 9.2 Job Performance Measure: Qualification record

## 10.0 Documentation

Document Development		
<p><b>PREPARED BY:</b> (Signature and date on file) <b>L. Stiegler</b> <b>Date: 06/06/07</b></p>	<p><b>REVIEWED BY:</b> (Signature and date on file) <b>J. Peters, CIH</b> <b>Date: 06/18/07</b></p>	<p><b>APPROVED BY:</b> (Signature and date on file) <b>R. Selvey, CIH IH Manager</b> <b>Date: 06/18/07</b></p>
<p>ESH Coordinator/ Date:  <i>none</i></p>	<p>Work Coordinator/ Date:  <i>none</i></p>	<p>SHSD Manager / Date  <i>None</i></p>
<p>QA Representative / Date:  <i>none</i></p>	<p>Training Coordinator / Date:  <i>none</i></p>	<p>Filing Code:  <b>IH52</b></p>
<p>Facility Support Rep. / Date:</p>	<p>Environ. Compliance Rep. / Date:</p>	<p>Effective Date:</p>

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none	none	<b>06/18/07</b>
<p>ISM Review - Hazard Categorization</p> <p><input type="checkbox"/> High</p> <p><input checked="" type="checkbox"/> Moderate</p> <p><input type="checkbox"/> Low/Skill of the craft</p>	<p>Validation:</p> <p><input type="checkbox"/> Formal Walkthrough</p> <p><input type="checkbox"/> Desk Top Review</p> <p><input type="checkbox"/> SME Review</p> <p>Name / Date:</p>	<p>Implementation:</p> <p>Training Completed: Tracked in BTMS</p> <p>Procedure posted on Web: 06/18/07</p> <p>Hard Copy files updated: 06/18/07</p> <p>Document Control: 06/18/07</p>


Revision Log		
<p>Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls</p> <p>Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input type="checkbox"/> none of the above</p> <p>Section/page and Description of change:</p>		
SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:



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## Attachment 9.1

### Short Operating Instructions

	Step	User Action	
1	<b>Power On</b>	Push the Yellow POWER button on the bottom of the meter face.	
2	<b>Battery Check</b>	Check the battery power in the upper right hand side of the display. Plug into power AC or DC power source if needed.	
3	<b>Meter response</b>	For typical survey work, a scan is done after turning the meter on by simply pressing the blue RUN button. The reading is on a scale of 0 – 2000 MHz.	
4	<b>Record Measurements</b>	Point the meter at the RF source and check the grid for frequency spikes.	

SHSD Industrial Hygiene Program

## **Protek 3201N RF Field Strength Analyzer Operation**

### **Job Performance Measure (JPM) Completion Certificate**

Candidate's Name	Life Number:
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**Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam & Demonstration of Methodology**

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. <b>Hazard Analysis</b>	Understands the hazards and exposure potential to the self as sampler and workers in the area.			
2. <b>Sampling Equipment</b>	Knows where equipment needed for the procedure is located.			
3. <b>Field Sampling methods</b>	Demonstrates correctly setting up sampling equipment. <ul style="list-style-type: none"> <li>• Meter warm-up</li> <li>• Changing frequency level between GHz, MHz, and kHz.</li> <li>• Changing range of readings full scale.</li> </ul>			
4. <b>Field Sampling methods</b>	Describes how to correctly selecting sample locations and orient meter.			
5. <b>Documentation</b>	Demonstrates correctly filling out IH monitoring forms.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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